

CLAIMS

What is claimed is:

1. A method for controlling a wireless device comprising:
amplifying a signal for transmission using an amplifier;
5 generating a control signal based upon a signal related
to an output level of said amplifier; and

controlling, with said control signal, at least one
variable bias voltage generator connected to said amplifier
for controlling a bias level of one or more transistors in
10 said amplifier, said controlling a bias level including
controlling a voltage across one or more transistors in said
amplifier and controlling an operating point of one or more
transistors in said amplifier to improve efficiency in said
amplifier.

15 2. The method of Claim 1 wherein controlling said at least
one variable bias generator comprises controlling a voltage
output of at least one voltage regulator by said control
signal.

20 3. The method of Claim 2 wherein said at least one voltage
regulator comprises at least one switching regulator.

4. The method of Claim 1 wherein said one or more
25 transistors are field effect transistors (FETs), and said
controlling said operating point comprises controlling a gate
bias voltage of said one or more FETs.

5. The method of Claim 1 wherein controlling said variable
30 bias generator controls a drain-source voltage of one or more
MOSFET transistors in said amplifier.

6. The method of Claim 1 wherein controlling said variable bias generator controls a drain-source voltage of one or more MESFET transistors in said amplifier.

5 7. The method of Claim 1 wherein controlling said variable bias generator regulator controls a collector-emitter voltage of one or more bipolar transistors in said amplifier.

8. The method of Claim 7 wherein said controlling said
10 operating point of one or more transistors in said amplifier comprises controlling a base bias voltage applied to said one or more bipolar transistors.

9. The method of Claim 1 wherein said signal related to an
15 output level of said amplifier is a first signal generated in response to an output of said amplifier, and said controlling a bias level comprises controlling said bias level in response to said first signal.

20 10. The method of Claim 1 wherein said bias level is reduced as an average power output of said amplifier is reduced.

11. The method of Claim 1 wherein said signal related to an
output level of said amplifier is a baseband signal, and said
25 controlling a bias level comprises controlling said bias level in response to said baseband signal.

12. The method of Claim 1 wherein said controlling a bias
level comprises controlling a bias level in response to a
30 received signal.

13. A mobile wireless device comprising:

an amplifier connected to receive an input signal to be transmitted, said amplifier having an amplifier output terminal;

5 at least one controllable voltage generator having a battery input terminal and a voltage control terminal, said generator having an output voltage terminal connected to said amplifier; and

a controller having an output connected to said control
10 terminal of said generator and a controller input terminal connected to receive a signal related to an output level of said amplifier, said controller controlling said generator to vary a bias level of one or more transistors in said amplifier based on said signal related to said output level of said
15 amplifier, varying said bias level including varying a voltage across one or more transistors in said amplifier and varying an operating point of one or more transistors in said amplifier to improve efficiency in said amplifier.

20 14. The device of Claim 13 wherein said one or more transistors have a respective control terminal, and wherein said controller controls a bias level of said control terminal for operating said one or more transistors around an operating point.

25 15. The device of Claim 13 wherein said one or more transistors are field effect transistors, and said regulator controls a drain-source voltage of said one or more transistors.

30 16. The device of Claim 13 wherein said one or more transistor are bipolar transistors, and said regulator

controls a collector-emitter voltage of said one or more transistors.

17. The device of Claim 13 wherein said one or more
5 transistors in said amplifier include one or more output transistors of said amplifier.

18. The device of Claim 13 wherein said signal related to an
output level of said amplifier is a baseband signal, said
10 device further comprising a baseband signal generator, wherein said controller receives said baseband signal and controls said voltage generator and bias level in response to said baseband signal.

19. The device of Claim 13 wherein said controller comprises
15 a receiver circuit connected to receive said signal related to an output level of said amplifier.

20. The device of Claim 13 further comprising a matching
20 network connected between said amplifier output terminal and a load.

21. The device of Claim 20 wherein said load is an antenna.

22. The device of Claim 13 wherein said voltage generator is
25 a switching regulator.

23. The device of Claim 13 wherein said control terminal of
said generator is a feedback terminal.

24. The device of Claim 13 wherein said one or more
30 transistors comprises at least two transistors.

25. The device of Claim 13 wherein said bias level is reduced as an average power output of said amplifier is reduced.

26. A mobile wireless device comprising:

5 an amplifier connected to receive an input signal to be transmitted, said amplifier having an amplifier output terminal;

at least one controllable voltage generator having a battery input terminal and a voltage control terminal, said
10 generator having an output voltage terminal connected to said amplifier;

a receive portion that receives a signal from another transmitting device and, in response, generates a transmitter power control signal; and

15 a controller having an output connected to said control terminal of said generator and a controller input terminal connected to receive said transmitter power control signal to cause an average power output of said amplifier to be related to said transmitter power control signal, said controller
20 controlling a bias level of one or more transistors in said amplifier based on said transmitter power control signal, said controlling a bias level including controlling a voltage across one or more transistors in said amplifier and controlling an operating point of one or more transistors in
25 said amplifier to improve efficiency in said amplifier.

27. The device of Claim 26 wherein said one or more transistors have a respective control terminal, and wherein said controller controls a bias level of said control terminal
30 for operating said one or more transistors around an operating point.

28. The device of Claim 26 wherein said one or more transistors are field effect transistors, and said regulator controls a drain-source voltage of said one or more transistors.

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29. The device of Claim 26 wherein said one or more transistor are bipolar transistors, and said regulator controls a collector-emitter voltage of said one or more transistors.

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30. The device of Claim 26 wherein said one or more transistors in said amplifier include one or more output transistors of said amplifier.

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31. The device of Claim 26 further comprising a matching network connected between said amplifier output terminal and an antenna.

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32. A method for controlling a wireless device comprising:
amplifying a signal for transmission;
receiving a signal from another transmitting device;
generating a transmitter power control signal in response to said signal received from said another transmitting device;
controlling a voltage output of a voltage generator by
25 said power control signal, said voltage generator providing voltage to said amplifier such that an average power output of said amplifier is related to said power control signal, said voltage to said amplifier controlling a bias level of one or more transistors in said amplifier based on said power control
30 signal, said controlling a bias level including controlling a voltage across one or more transistors in said amplifier and controlling an operating point of one or more transistors in said amplifier to improve efficiency in said amplifier.

33. The method of Claim 32 wherein said voltage generator provides voltage to a power supply terminal of said amplifier.

5 34. The method of Claim 32 wherein said one or more transistors each have a respective control terminal, and wherein said voltage generator controls a bias level of said control terminal to control an operating point of one or more transistors in said amplifier to improve efficiency in said
10 amplifier.

35. The method of Claim 32 wherein said voltage generator controls a drain-source voltage of one or more field effect transistors in said amplifier.

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36. The method of Claim 32 wherein said voltage generator controls a collector-emitter voltage of one or more bipolar transistors in said amplifier.

20 37. The method of Claim 32 wherein said bias level is reduced as said average power output of said amplifier is reduced.